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Emotional Interactions with Portable Devices in Everyday Contexts

ABSTRACT:

Emotions have, in recent years, been of great importance for the field of design both in research and in practice. An interesting and challenging area for investigation is people's emotional interactions with portable interactive devices (PIDs). PIDs pose interesting challenges for designers because they are specifically designed to be transported and utilised across a variety of locations and social situations. They present new means of interacting with the world; allowing people to interact with entertainment, news, information and communicate with other people virtually anytime, anywhere.

This paper reports on a study in progress that explored people's emotional experience with portable interactive devices over the first six months of use. The approach is based on activity theory, which is concerned with understanding the relation between people's thoughts and awareness of their lives and the activities and actions performed in the real world. To study people's experiences a triangulation methodology was applied. Participants were asked to capture their diverse experiences with portable entertainment/media devices (including mp3's and PDAs) in a diary over the course of six months as well as participate in intermittent interviews and a co-discovery. The intent was to record their everyday experiences with these devices in a longitudinal and qualitative manner.

Initial findings indicate that people interact with these types of PIDs in an emotional way both at a personal level and a social level. Furthermore, analysis suggests that the overall emotional experience over the course of six months is related directly to the proportion of negative social interactions experienced over that period. It appears that this relationship does not exist with negative personal experiences. These initial findings are discussed within the context of other portable interactive devices including medical/health products. Finally the implications of the findings for future portable device design and future research directions for the study are outlined.

KEYWORDS: design and emotion, experience design, portable device design, emotional experience

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Emotional Experiences and Portable Devices

Experiencing emotions is a central part of being human. We are indeed governed not just by our thoughts and actions but also by our emotions. Thus, emotions play a vital role in everyday life. Emotional experiences can occur in many different circumstances; privately, during socialisation and interaction with others as well as when we interact with products and interfaces in the environment. As such the designs of the devices are critical in influencing our experiences in this world in either a positive or negative fashion. As designers it is important to consider the design of these devices so as to enhance emotional experiences within the context of everyday interactions.

Many people nowadays are aware of, surrounded by, or physically interact with portable interactive devices (PIDs). These may include mobile telephones, portable music players, portable digital video players, personal digital assistants, portable medical products and many more. These products mediate new ways of interacting with the world; allowing people to communicate and interact with entertainment, news, information and other people virtually at anytime, anywhere in the world (Hamill & Lasen, 2005; Jones & Marsden, 2006). PIDs were touted as opening up entire new worlds of excitement and life-changing opportunities. As Wiberg (2005) comments "So, while the computer of yesterday was occupied with crunching numbers, today and tomorrow's technology will be occupied with maintaining our social contacts with one another" (2005 p.vi). Has this vision come to be? A possible answer to this question can be found in statistics dating from the early years of mobile telephone research. As Jones and Marsden (2006) report, the use of very advanced technology such as WAP (wireless application protocol), video calling and mobile payment schemes failed while the use of very basic applications such as voice calling and text-based messaging thrived. Why would these very advanced, supposedly appropriate and useful applications fail while the basic ones succeed? The answer: the latter "meet basic human desires in simple, direct ways" (Jones & Marsden, 2006 p.5).

When considering emotional, social and enjoyable interactions within the context of design the starting point should not be "how can this device make the life of the person more enjoyable?" but rather "what type of experiences make people happy in everyday life?" followed by "how can the device/s facilitate or enhance these experiences through everyday use?". This shifts the focus away from the product per se and draws attention to the people and activities. Portable devices (PIDs) pose an interesting challenge in that, by definition, they are used in various kinds of situations and across different contexts; demanding different interaction modes depending on the situation. As Picard and Wexelblat (2002) propose "systems that ignore the emotional components of human life are inevitably incomplete and inferior" (2002 p.698). Likewise Shneiderman (2002) contends "the old computing was about what computers could do; the new computing is about what users can do" (2002 p.2). The fundamental step in making new technology usable, practical and enjoyable involves investigating and understanding people and their experiences with products in everyday environments and situations; and designing the product based on that critical understanding.

Despite the current focus on emotions and the advent of PIDs within society it is interesting to note that although there has been research into certain aspects of emotional interaction with PIDs; research specifically focusing on emotions combining contextual and longitudinal factors with portable devices (excluding mobile phones) appears to be limited. Stelmaszewska, Field and Blandford (2005) studied peoples experiences and emotions when using technology; including PDAs, mobile phones and MP3 players. Although interesting aspects in relation to the social considerations of use were reported, the research does not appear to have methodologically recorded or documented it longitudinally. Another study conducted by Geisler and Golden (2002) reported on results from structured interviews conducted with PDA users. In this case neither the emotional reaction nor the longitudinal aspect of use was specifically observed. The only exception is mobile telephone research. There have been several research studies touching upon the aspect of emotion, interaction over time and contextual aspects of mobile telephone use (Arvola, 2004; Ito, Okabe, & Matsuda, 2005; Jones & Marsden, 2006; Ling, 2004; Palen, Salzman, & Youngs, 2001; Plant, 2001).

This study attempts to bridge the gap in the literature with particular types of PIDs. The approach reflects the study conducted by Dourish (2001). The concern is not only the physical interface of the products or their usability aspects but also with the ways in which they are experienced in the everyday environment. As such, the research centres on exploring emotional interactions with portable devices in real life contexts over time. There are three elements of focus. First, the research intends to concentrate on the emotional experience of use. Second, it explores interactions between users and their PIDs over the course of six months. Third, these interactions are situated within the social and cultural context of their everyday use.

Therefore, the overall aim of the research is to support and enhance the evolving emotional experience between people and PIDs. It is especially important to investigate this within the portable interactive product category since they are physically transported and used in various contexts. The research objectives include:

- Focusing mainly on the **emotional** aspects of interaction
- Situating experiences within **real life contexts** and situations
- Observing these evolving emotional experiences **over time**

Theoretical Framework

The theoretical framework is based on activity theory. This theory is concerned with understanding the relationship between people's thoughts, awareness, activities and actions performed in the real world (Nardi, 1996b). It is about the practical aspects of interaction.

As researchers in human-computer interaction (HCI) have outlined (Bannon & Bodker, 1991; Nardi, 1996a, 1996b), research dealing with the human-computer relationship was traditionally based on the theoretical foundations of information processing psychology. Theories found in earlier HCI literature tended to simplify the user-artefact interaction to

minuscule levels and forget about the meaning behind the activities and the broader aspects of interactions (Brave & Nass, 2002; Nardi, 1996b). As a result, other aspects of the interactions including emotions and social and cultural aspects "…seemed at best marginally relevant to human-computer interaction" (Brave & Nass, 2002 p.3). Activity theory and other related theoretical concepts have moved towards understanding interaction in real-life contexts. Activity theory suggests that products can only truly be understood within real-life contexts and across time (Nardi, 1996b). It attempts to deal with engagement in the real world, rather than abstract ideas about interactions (Dourish, 2001). As Bannon and Bodker (1991) explain; it is difficult to understand artefacts in isolation, without considering the actions and activities occurring within the use settings. It is understood that these use settings are always changing and evolving, they are not static. Everyday practice is always situated in a social, cultural and environmental context. To study interactions between humans and products they must be situated within a framework that takes this changing interrelationship into account. This context involves other artefacts, objects and other people. As such, from an activity theory standpoint, understanding how people perceive and act in these real life contexts is crucial (Nardi, 1996b). By viewing interactions between people and artefacts in this light a new understanding of the world arises. Artefacts become the means to an end, not the end itself. This is an appropriate foundation to work with considering the focus in the current research is on exploring and understanding the social, emotional and contextual matters concerning human-product interaction.

Experiment: Portable Devices within Everyday Use

An experiment was conducted exploring the aspects that influence the emotional experience of interacting with portable devices. One of the primary aims of this research is to observe what factors influence the emotional interaction with portable devices as well as compare the difference between portable entertainment/media devices (study group A) and portable medical/health devices (study group B). This paper reports on the experiment, findings and discussions of study group A, who utilised MP3 players and PDAs over the course of six months. Results from the experiment provide data to better understand how to appropriately design future portable devices to support positive (and avoid negative) emotional experiences in everyday situations. The methodology and analysis will be briefly described followed by the initial findings.

Methodology

The experiment centered on recording people's experiences with a portable device in everyday life over the course of the first six months of use. The intent was to capture the initial stages of interaction between participant and device and to observe in a longitudinal fashion how much the experience and relationship between the user and device changed and evolved over the course of the first six months. Nine participants were involved in this first part of the study; six utilised MP3 devices while three used PDAs. There is literature to support using anywhere between 5-10 participants to collect enough data for the validity of studies relating to portable computing (Nielsen, 1993). Other longitudinal, qualitative studies have used even smaller numbers of participants

(Petersen, Madsen, & Kjaer, 2002). Users with two weeks experience with the portable device, at the most, were recruited; thus attempting to capture the initial stages of interaction and observe how it evolved over the six month period.

The study used a triangulation methodology (Denzin, 1989) consisting of diaries, interviews and co-discovery. The triangulation approach helps to bring research rigour into the experiment. It offers multiple channels to acquire, analyse, and compare data (Denzin & Lincoln, 2003; Robson, 2002), making the research and the end results more reliable and valid. Also, triangulation methodology can increase the theoretical generalisations emerging from the study (Flick, 2006). The experiment was divided into the following stages:

- Initial introduction
- Participant diary
- Intermittent consultations
- Co-discovery

Initial introduction

The initial introduction stage was the first formal step of the experiment. This involved meeting the participant, as well as explaining the more detailed aspects of the process they were going to be involved in. During this stage an initial interview was performed. This interview was centered on:

- Gaining knowledge about the participant's expectations of the product
- Emotions felt towards the product at the time
- The expectation of the benefits the device might provide
- The possible issues the device might provide

The interview was audio recorded and was later transcribed and analysed using Atlas.ti. The initial interview generally took 15-20 minutes.

Participant diaries

The diaries were used by participants to record relevant interactions with the products as they experienced them over the six month period. They were asked to fill out the diary once a week. The structure of the diary provided for up to three experiences per week. They were to reflect mostly on the emotional experiences with the product during activities. At the same time they were to record issues relating to:

- Context of interaction (location/time/date)
- Activity performed (purpose of use)
- Social interaction (other people/crowd)
- Summary of their perception of the emotional experience (perceived emotional reaction to experience)

The participants recorded the main details of their interactions with the product; especially interactions they felt were emotional. They also rated the overall emotional experience by using the emotional chart (Figure 1) (Gomez, 2005). This is based on Russel's (2003) model of Core Affect which depicts basic emotions. Russell's model has been used as an effective self-reporting tool in other studies investigating emotional reactions to products (Desmet, 2002; Fagerberg, Stahl, & Hook, 2004; Gomez, 2005).

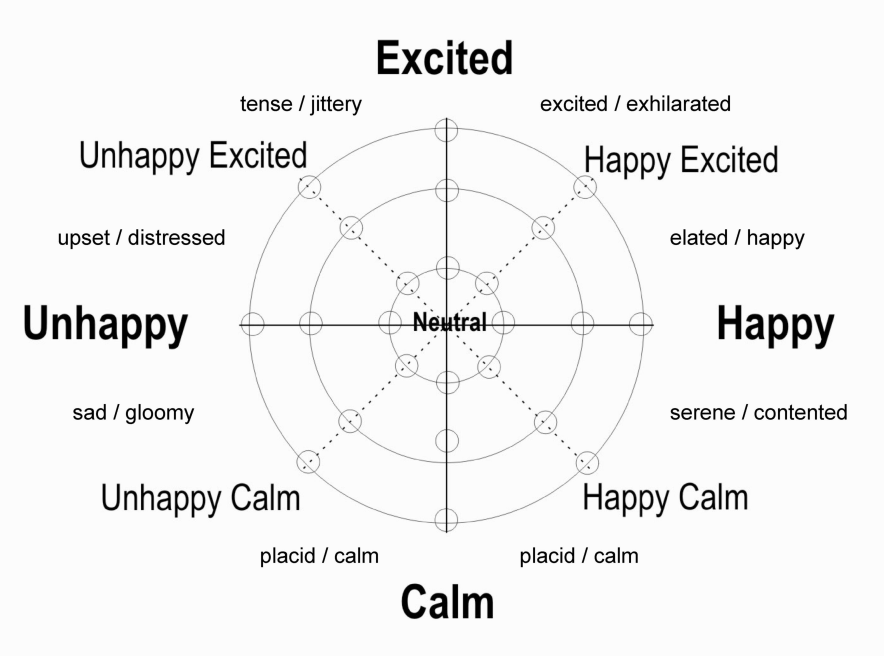

FIG 1. Emotional Chart (after Russell, 2003) (Gomez, 2005)

Participants were informed they should spend on average 5-10 minutes a week filling out the diary. The performance of the diary was evaluated during a pilot study prior to its inclusion in the study.

Intermittent consultations

Between 5 and 8 intermittent consultations (semi-structured interviews) were conducted with participants over the six month period. The first consultations were performed in the first month, followed by one a month for the remaining five months. The purpose of these consultations was twofold; to regularly check any problems the participant may be experiencing with the diary as well as record more detailed information about the experiences with the product. During the interviews participants were asked the following set of questions:

- On average how often have you used the product?
- How would you characterise your feelings towards the product at this stage? (positive / negative / neutral)

- What have been some of the positive aspects of using the product?
- What have been some of the negative aspects of using the product?
- How has the surrounding environment or social context affected the use of the product in a positive or negative way?

The interviews took 15-20 minutes on average, and were documented through the use of audio recording. They have been transcribed and will be analysed using Atlas.ti software.

Co-discovery

The final part of the study involved a co-discovery session between two and three participants that used the same type of the device. The participants discussed their emotional experience with the product over the six-month period. This part of the experiment focused on how their expectations in the beginning changed as their experiences with the products evolved over the six month period. They also discussed how their specific experiences were affected by the different contexts of use.

The co-discovery was audio and video recorded data. The audio will be analysed using Atlas.ti and the video data will be analysed using Noldus Observer software. The co-discovery sessions took around 45 minutes on average.

Initial Findings

Currently, preliminary analysis has been conducted. The data was analysed using a content analyses technique (Bauer & Gaskell, 2000; Flick, 2006; Krippendorff, 2004). The written data is analysed through a coding system to ascertain its meaning and associations. The analysis to date has focused on interpreting the written data collected through the experiment, specifically the diary responses.

To contextualise the analysis and findings the data sets are split into two categories. Firstly, data relating to specific activities within the overall six month timeframe are referred to as micro-level interactions. For instance a participant may use the MP3 player to listen to a song on a train; this would be an example of a micro experience and could be analysed independently. Secondly, data relating to the overall experience over the course of six months are referred to as global-level interactions. In this case, the data relates to the same participant and the overall perception of the feelings regarding using the MP3 player over the six month period, and which is composed of many micro-level interactions throughout.

Global-level experiences

The first aspect analysed was the overall experience reported by the participants across time. This was determined by analysing the interviews. One of the questions asked how they characterised their emotion toward the product at that point in time. Figure 2 is an example from participant 7b showing overall experiences captured over the six month period.

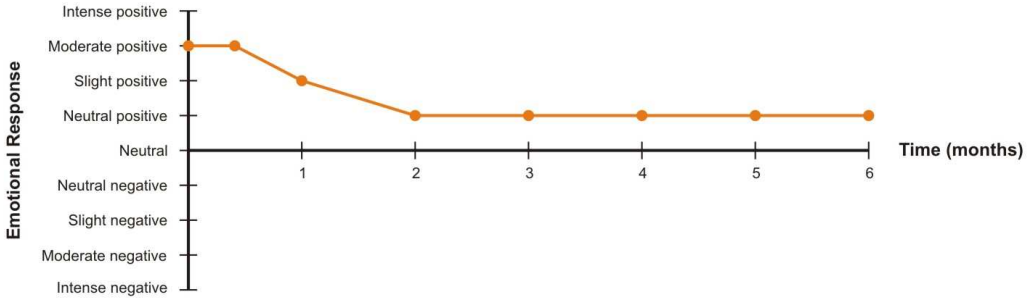

FIG 2. Global-level: overall experiences plotted across time

This example represents a participant that has undergone fairly constant emotional experience. Although it is positive in valence the flatness of the line reveals that the participant has recorded the experience as overall ordinary.

Personal and social interactions in context

Preliminary analysis of the micro-level data strengthens the idea that PIDs are used both at a personal level and at a social level. To date 142 experiences have been analysed. Out of these 65% (92 experiences) were noted as being personal while 35% (50 experiences) were noted as being social (Figure 3). Personal interactions referred to activities in which participants performed activities in private or where other people did not influence their emotional reactions to those experiences. Social interactions referred to activities in which the presence of other people affected the emotional reactions of the participants.

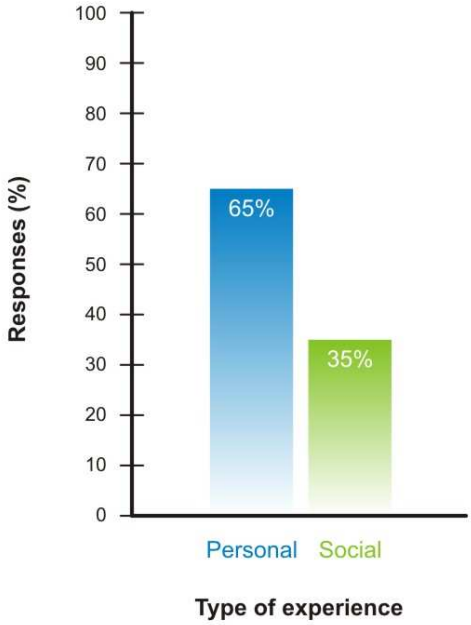

FIG 3. Total percentage of personal and social responses reported by all respondents

Figure 3 indicates that participants identified just over a third of their experiences as social and not purely personal. This relationship repeats itself when breaking down the data between participants. Across the participants the social experiences identified ranged between 25% and 43% (Figure 4).

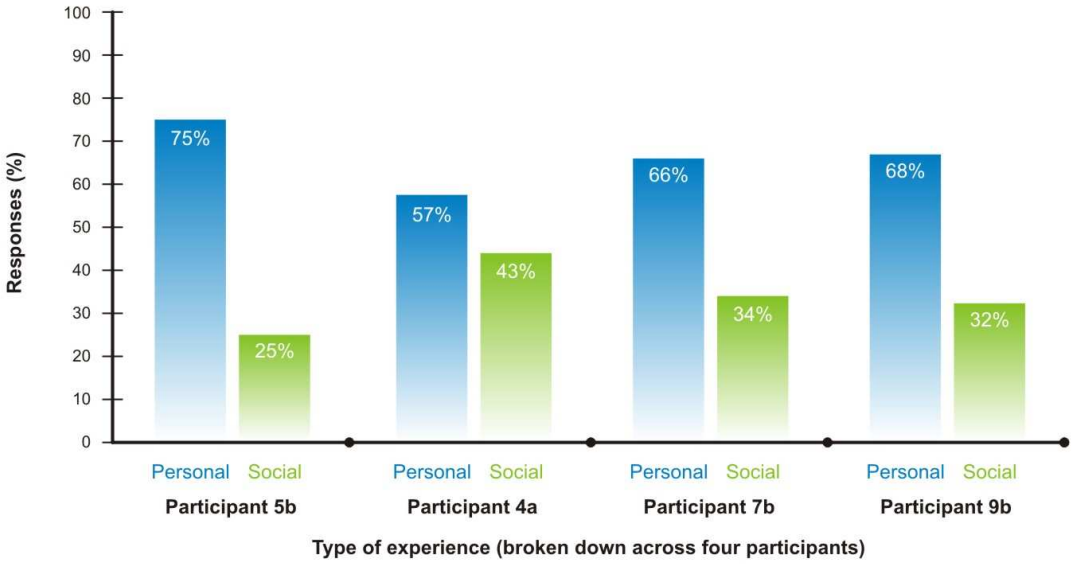

FIG 3. Percentage of personal and social responses reported broken down to four participants

Although these are early findings, the data could imply that there is a somewhat constant relationship between the personal and social experiences perceived by the participants over an extended period of time with these types of devices.

Personal and social interactions and their effect on overall experience

Preliminary analysis has indicated another interesting aspect regarding the social experiences and their relationships to the overall perceived experience at the global level. This was done by breaking the personal and social experiences for each participant into positive and negative.

When the personal and social experiences were broken down it was identified that the overall emotional experience perceived by the participant was related to the comparison between negative experiences reported for personal and social experiences. That is, if a participant reported more negative social experiences than negative personal experiences, then the overall experience as plotted along a timeline (Figure 2) became flat and constant, almost reaching the neutral line. On the other hand, if a participant reported less negative social experiences than negative personal experiences the line plotted along the graph became more varied and erratic. This indicates that ongoing negative social experiences over the course of time has significant influence on the overall experience, while more negative personal experiences do not appear to do the same (Figure 5)

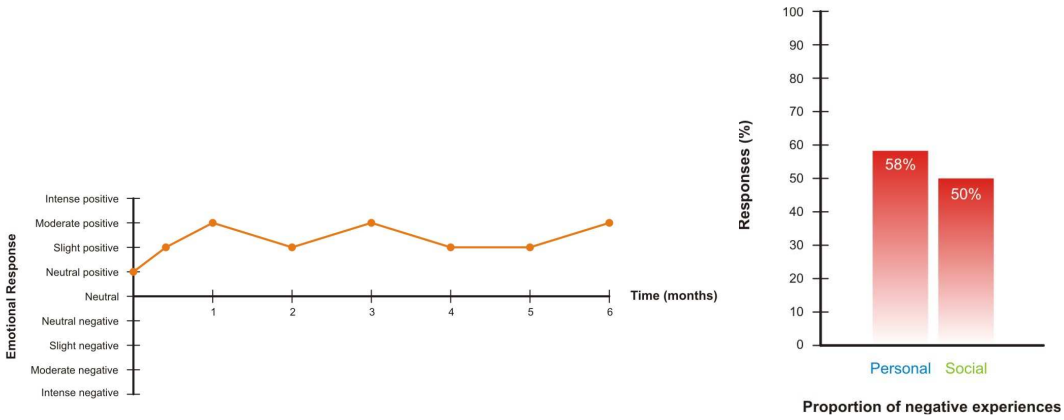

FIG 5. Participant 5b overall experience (left) and corresponding proportion of negative experiences reported (right)

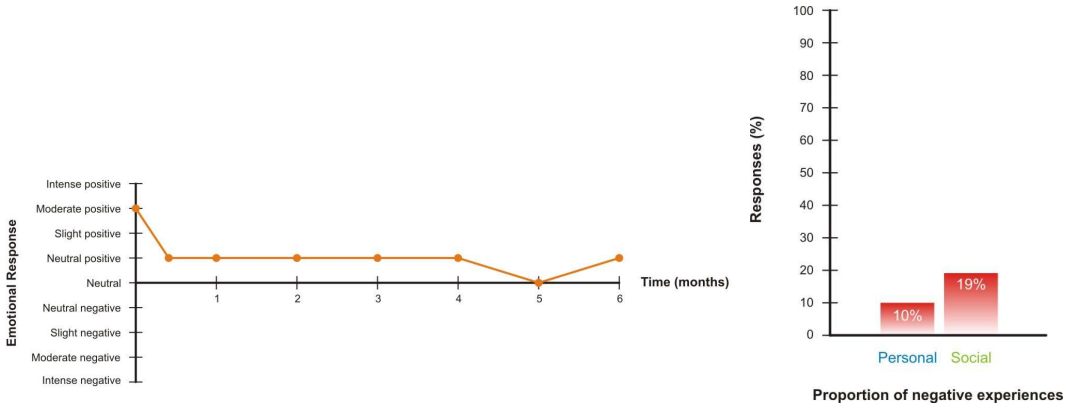

FIG 6. Participant 4a overall experience (left) and corresponding proportion of negative experiences reported (right)

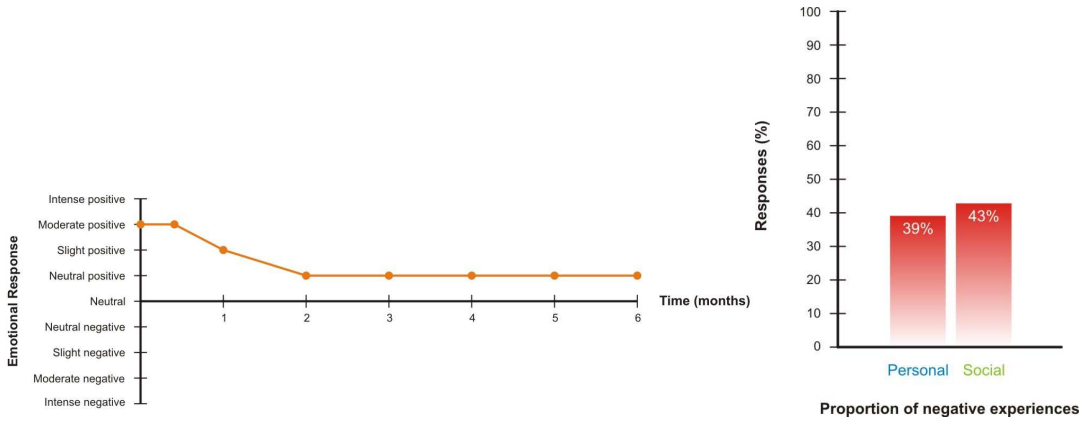

FIG 7. Participant 7b overall experience (left) and corresponding proportion of negative experiences reported (right)

The above figures (Figure 5, 6 and 7), on the left, outlines the nature of the participant's experience over the course of time. Alongside this the corresponding graph of the participants reported negative experiences; split into personal and social, is represented. The graphs suggest that if a participant experiences relatively more negative social experiences than negative personal experiences then the overall experience across time will flatten. In other words the participant becomes somewhat indifferent to the device. The same relationship is not observed when negative personal experiences outweigh negative social experiences. In these cases, the experience over time is varied and fluid. This relationship was observed for the data analysed so far which includes four participants. However, it will be important to analyse all available data to determine whether this trend is consistent and significant.

Implications for Design

These findings have some interesting implications for design. Firstly, Figure 3 demonstrates that PIDs are used for personal as well as social interactions. The finding

adds further support to other studies conducted in this area using similar types of devices (Stelmaszewska et al., 2005; Stelmaszewska, Fields, & Blandford, 2004). Secondly, the interesting result that emerged from further analysis of the data is that this trend appears to be consistent when broken down across participants (Figure 4); social interactions appear to exist within a certain range over an extended period of time and always smaller in proportion to personal interactions. Thus, it is crucial that the social aspect of interactions with PIDs in everyday life be considered from the outset.

Nevertheless, the fact that people perceive their interactions with PIDs as more personal than social does not imply that social interactions are irrelevant or inconsequential to the overall experience. In fact, further analysis of the data suggests the very opposite. It was noted that if more negative experiences were reported regarding social interactions compared to personal interactions then the overall experience of the participant over time was somewhat apathetic to the device. This did not change regardless of how many actual experiences were recorded; as long as the negative social experiences outweighed the negative personal experiences the trend continued. The same did not apply if the negative personal experiences outweighed the social. The design of portable devices needs to take this particular aspect into account as any negative social interaction experienced by users appears to impact on the overall perceived experience of the user over an extended period of time.

Conclusions and Further Work

Emotions are central to everyday experiences including interactions with surrounding products and devices. An interesting and challenging area for investigation is people's emotional interaction with portable interactive devices (PIDs). This paper reported on a study in progress that explored people's emotional experience with portable interactive devices over the first six months of use. The users and their emotional experiences with products in everyday settings was the fundamental starting point.

To date, some initial analysis has been conducted on the data. Three initial findings are reported. Firstly, findings indicate that people interact with these types of PIDs in an emotional way both at a personal level and a social level. This lends further support to studies that have already been conducted that suggest a similar result (Stelmaszewska et al., 2005; Stelmaszewska et al., 2004). Secondly, it was discovered that even when broken down across each participant, personal experiences always outweighed negative experiences across time. Thirdly, the overall emotional experience over time is related directly to the proportion of negative social experiences recorded. Proportionally, if negative social experiences outweighed negative personal experiences then the user perceived their overall experience as somewhat indifferent.

In conclusion it is interesting to note that PIDs are used on a social level only within a certain range. Even over an extended period of time and across different users this trend is consistent. Further it is important to recognise that the designs of these types of portable devices need to reduce any negative experiences on a social level as this will impact on the entire experience in what appears at this stage to be a negative fashion.

Further studies and analysis of the data need to be carried out to determine if these trends are consistent and significant. Further types of analysis can also be performed on the data to identify additional relationships at all levels of interaction. It is predicted that once further analysis is conducted some interesting trends about peoples use with portable devices might be revealed.

To compliment the reported study, a similar investigation is currently being conducted with participants using portable medical/health devices including pedometers and heart-rate monitors. The intention is to compare and analyse the two sets of findings between group A and group B to determine what relationships occur between the two different product types. Overall it is hoped that the findings of the larger investigation will assist designers to develop portable devices across the media/entertainment and medical/health device type categories so as to enhance positive experience of using these devices in everyday contexts over extended periods of use.

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